

PATENT CLAIMS

1. A road surface property device for mounting in a vehicle, comprising
a sensor device having a radiation emitter directed towards the road surface and
5 at least one detector for detecting the radiation reflected from the road surface and
providing an output accordingly, and data processing means for processing the
output from the at least one detector to determine surface properties of the road and
providing an output accordingly,
transmission means for receiving said output from the sensor device and
10 conducting a wireless transmission of road surface property data based thereon to a
receiver exterior to the vehicle,
characterised in that
the device further comprises wireless receiver means adapted to receive radio
transmissions of data from transmission means of devices similar to the device itself,
15 and
data output means for receiving an input from the receiver means and
presenting an output perceivable by the driver of the vehicle based thereon.
2. A device according to claim 1, comprising
20 position means for generating position data for estimation of the current
position of the device,
wherein the transmission means is arranged to transmit said position data.
3. A device according to claim 1 or 2, wherein the data output means further is
25 arranged for receiving an input from the detector means and presenting an output
perceivable by the driver of the vehicle based thereon.
4. Sensor device for non-contact detection of conditions of a surface, such as a road
surface, the system comprising
30 a light source for emitting light towards the surface,

a first detector arranged for receiving a portion of said emitted when reflected from said surface and producing a first output according to the intensity thereof,

a second detector arranged for receiving a portion of said emitted when reflected from said surface and producing a second output according to the intensity thereof, and

control means for receiving and evaluating the received output from the detectors based on the amount of diffuse reflected and mirror reflected light,

characterised in that

the sensor device further comprises

a first linear polarization filter arranged in the path of the light from the light source and to the surface for the polarization of the emitted light, and

a second linear polarization filter arranged in the path of the light between said surface and one of the first detector and the second detector.

5. Sensor device according to claim 4, wherein the direction of polarization of the second filter is parallel to the direction of polarization of the first filter.

6. Sensor device according to claim 5, comprising a third polarization filter arranged in the path of the light between said surface and the other one of the first detector and the second detector, wherein the direction of polarization of the third filter is perpendicular to the direction of polarization of the first and the second filter.

7. Sensor device according to claim 5 or 6, wherein the first and second filter are constituted by one linear polarization filter and a beam splitter is arranged between the first polarization filter and the light source for the diversion of a portion of the light reflected from the surface into said detector.

8. Sensor device according to claim 4 or 6, further comprising a first beam splitter arranged in the path of the light from the first linear polarization filter and to the surface for the diversion of a portion of the light reflected from the surface into a

second path, and a second beam splitter arranged in the second path for the diversion of a portion of the light in the second path into the first detector and the transmission of a portion of the light in the second path into the second detector.

- 5 9. Sensor device according to any of the preceding claims, comprising a reference light source arranged to emit light substantially in the direction and path of the first light source, wherein the reference light source emits light of a wavelength on which said polarization filters of the device have substantially no effect, so that the detection of the light from the reference light source by the first and second detector
10 may be used for verification of the function of the system.
10. Sensor device according to any of the preceding claims, further comprising a light source for emitting light within the wavelength range of 930 nm to 970 nm towards the surface and an absorption detector for receiving the reflection of said
15 emitted light and producing an output to the control means accordingly.
11. Sensor device according to any of the preceding claims, further comprising a light source for emitting light towards the surface, the path of the light having an angle in the range of 15° to 70°, preferably in the range of 25° to 60° to the surface
20 normal and a retro-reflection detector arranged for receiving the retro-reflection of said emitted light in said path and producing an output to the control means accordingly.
12. Sensor device according to any of the preceding claims, further comprising a
25 light source for emitting polychromatic light towards the surface and at least two range detectors arranged to detect each a wavelength range of the reflection of said emitted light and producing an output to the control means accordingly.

13. Sensor device according to claim 12, comprising least three of said range detectors arranged to detect each a wavelength range of the reflection of said emitted light and producing an output to the control means accordingly.
- 5 14. Sensor device according to claim 12 or 13, wherein the said wavelength ranges each comprises a range within the visible wavelength range.
- 10 15. Sensor device according to any of the preceding claims for mounting in a vehicle, further comprising a noise sensor for receiving the noise from the vehicle travelling along a road and producing an output to the control means accordingly.
16. A road surface sensor device according to any of claims 1-3, wherein the sensor device comprises the characteristics of the device according to any of claims 4-15.
- 15 17. A road surface property device to be mounted on a vehicle for contact-less detection of the surface properties of the road surface and providing an output accordingly, comprising a radiation emitter directed towards the road surface and at least one detector for detecting the radiation reflected from the road surface and providing an output accordingly,
- 20 **characterised in that**
the device comprises washing means for the emitter and the at least one detector for recurrently flushing thereof.
- 25 18. A device according to claim 17, wherein said washing means is connected to and operates concurrently with a windshield washer system of the vehicle.
19. A road surface property device to be mounted on a vehicle for contact-less detection of the surface properties of the road surface and providing an output accordingly, comprising a radiation emitter directed towards the road surface and at

least one detector for detecting the radiation reflected from the road surface and providing an output accordingly,

characterised in that

at least one detector of the device comprises a shutter device for allowing a temporal
5 access of radiation to the detector for a period of 1/10 to 1/50,000 seconds, preferably of 1/50 to 1/10,000 seconds.

20. Sensor device for non-contact detection of conditions of a surface, such as a road surface, the system comprising

10 a light source for emitting light towards the surface,
a first detector arranged for receiving a portion of said emitted when reflected from said surface and producing a first output according to the intensity thereof,

a second detector arranged for receiving a portion of said emitted when reflected from said surface and producing a second output according to the intensity
15 thereof, and

control means for receiving and evaluating the received output from the detectors based on the amount of diffuse reflected and mirror reflected light,

characterised in that

the device further comprises one or more arrangements for detecting conditions of
20 the surface selected from a group comprising:

an infrared light source for emitting light within the wavelength range of 930 nm to 970 nm towards the surface and an absorption detector for receiving the reflection of said emitted infrared light and producing an output to the control means accordingly,

25 a light source for emitting light towards the surface, the path of the light having an angle in the range of 15° to 70°, preferably in the range of 25° to 60° to the surface normal and a retro-reflection detector arranged for receiving the retro-reflection of said emitted light in said path and producing an output to the control means accordingly,

a light source for emitting polychromatic light towards the surface and at least two range detectors, preferably at least three range detectors, arranged to detect each a wavelength range of the reflection of said emitted light and producing an output to the control means accordingly, and

- 5 a noise sensor for receiving the noise from a vehicle travelling along a road and producing an output to the control means accordingly, on which vehicle the device is arranged.

21. A system comprising

- 10 a plurality of devices according to any of claims 1-20 each mounted in a separate vehicle, and

a plurality of stationary detector means for contact-less detection of the surface properties of the road surface and providing an output accordingly to transmission means for receiving said output and conducting a wireless transmission of road surface property data based thereon to the receivers of said devices.

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22. A system according to claim 21, comprising a plurality of stationary information arrangements having receiver means adapted to receive radio transmission data from the devices mounted in the vehicles as well as the stationary detector means, and
- 20 comprising visual communication devices arranged along roads for distributing information to the drives of vehicles on said roads based on said received road surface property data.